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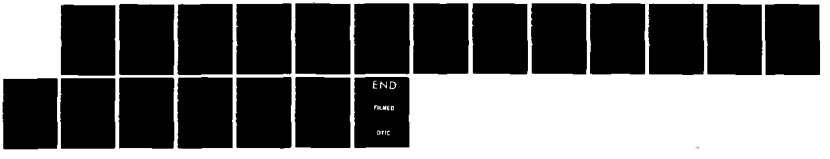

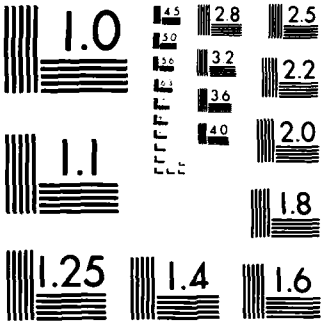

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The purpose of this project was to review the results of experimental investigations of landform development, landform evolution, and controls on landform morphology and dynamics. The emphasis was placed upon experiments carried out during 17 years at Colorado State University. A major goal was to make all of the significant results available in a monograph on experimental geomorphology.

Three main groups of experiments were considered as follows: 1) drainage basin morphology and dynamics, 2) channel morphology and dynamics, 3) alluvial fan morphology, dynamics and sedimentology. A monograph has been prepared that

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reviews, integrates and evaluates these experimental results, and it will be published by Wiley and Sons in 1986.

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EXPERIMENTAL STUDIES OF THE FLUVIAL SYSTEM

Final Report

S.A. Schumm
July 1, 1985

U.S. ARMY RESEARCH OFFICE

Contract MIPR ARO 111-83

Colorado State University

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Experimental Studies of the Fluvial System

Throughout the history of geomorphology, the changing form of the landscape with time has been a primary consideration. However, because of the obvious limitations of time, models of the evolution of landforms have depended largely on deductions based upon measurements of erosion rates in restricted areas of rapid erosion, or on a series of landform measurements, which are placed in an assumed erosional sequence (ergodicity). Because of a lack of information on the mechanics of landform erosion, divergent opinions concerning the origin and development of landforms exist, and theoretical approaches are often found wating because the fundamental assumptions upon which the theoretical structure is based are often unwarranted.

The problems are not solely academic because the long-term evolution of a landscape or of specific landforms is of concern with regard to the long-term stability and siting of power plants, bridges, highways, uranium-tailings-disposal sites and other toxic-waste disposal sites. On the short term, landform changes have legal implications and a geomorphic perspective on incised-channel stabilization and river behavior is needed in order to develop a rational approach to these important national problems.

As an approach to a better understanding of the behavior of the fluvial system, a program of experimental geomorphology was begun about 17 years ago at Colorado State University. During this period, experimental studies relating to the erosional evolution and response of the three major components of the fluvial system: (1) drainage basins, 2) alluvial rivers, 3) alluvial fans and deltas) have been performed with support from U.S. Army Research Office and National Science Foundation. During this period five M.S. theses and three Ph.D. dissertations were prepared under NSF support of experimental studies as follows: (see list of theses and dissertations) Begin, 1979; Edgar, 1973; Gardner, 1973; Khan, 1971; Mosley, 1975; Shepherd, 1972; Wildman, 1981; Zimpfer, 1975. Five M.S.

theses and four Ph.D. dissertations were completed with ARO support of experimental studies as follows: Bergstrom, 1980; Harvey, 1980; Lidstone, 1981; Macke, 1977; McLane, 1978; Mosley, 1972; Parker, 1977; Weaver, 1982; Zimpfer, 1982.

Numerous publications have been the result of this research (see list of publications) and other research projects have developed, as a result of the experimental studies, but significant amounts of research results have not been published, especially from the work of Bergstrom, 1980; Edgar, 1973; Elliott 1979; Garner, 1973; Harvey, 1980; Lidstone, 1981; Macke, 1977; McLane, 1978; Parker, 1977; Wildman, 1981; Weaver, 1982; Zimpfer, 1975, 1982).

In order to integrate the results of this experimental program and to make the results available to the scientific audience, it was proposed that the 17 years of research be re-evaluated, integated and published as a series of research papers or as a monograph on the experimental investigation of the fluvial system.

The primary objective was to make available in published form, a considerable amount of information based on the experimental studies and to determine profitable lines of further field and experimental work. In order to achieve the objectives of the project a monograph on experimental geomorphology has been written. In manuscript form it consists of 425 pages and 329 illustrations. The monograph that is entitled, Experimental Geomorphology; A Study of Small Landforms, will be published by John Wiley & Sons, Interscience Division in 1986. Two coauthors, who were former students and who performed experimental studies assisted in the preparation of the monograph. Dr. M.P. Mosley contributed significantly to Part II and Dr. William Weaver contributed significantly to Part III. The outline of the monograph follows.

Experimental Geomorphology
The Study of Small Landforms

S.A. Schumm, M.P. Mosley, W.E. Weaver

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Heavy Mineral Concentration
DISCUSSION

List of Publications:

In addition to the monograph 5 scientific papers were published as follows:

1. Begin, Z.B. and Schumm, S.A., 1984, Gradational thresholds and landform singularity: Significance for Quaternary Studies; Waternary Research, v. 21, p. 267-274.

2. Schumm, S.A., 1984, River morphology and behavior: Problems of extrapolation; in Eliott, C.M. (editor), River Meandering, Proc. Conf. on Rivers '83; American Soc. Civil Eng., N.Y., p. 16-29.

3. Watson, C.C., Schumm, S.A. and Harvey, M.D., 1984, Neotectonic effects on river pattern; in Elliott, C.M. (editor), River Meandering, Proc. Conf. on Rivers '83; American Soc. Civil Eng., N.Y., p. 55-66.

4. Schumm, S.A., 1985, Explanation and extrapolation in geomorphology: Seven reasons for geologic uncertainty: Japanese Geomorph. Union, Trans., v. 6, p. 1-18.

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6. Schumm, S.A., Mosely, M.P. and Weaver, W.E., 1985, Experimental Geomorphology: Studies of small landforms; Wiley and Sons, N.Y., in review.

Participating scientific personnel.

Coauthors of the monograph are:

William E. Weaver, Ph.D., geologist, Redwoods National Park, National Park Service, Arcata, California.

M. Paul Mosley, Ph.D., hydrologist, Water and Soil Science Centre, Ministry of Works and Development, Christchurch, New Zealand.

List of Theses and Disserations Resulting from Experimental Research

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